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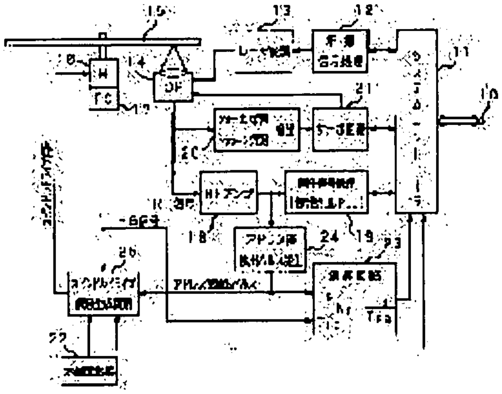
(54) DRIVING DEVICE AND METHOD OF DISK-LIKE RECORDING MEDIUM

(57)Abstract:



PROBLEM TO BE SOLVED: To facilitate the spindle servo operation even when the taking-out of a specific signal from an optical disk becomes impossible due to the focus error or tracking error, by detecting the reading position on the optical disk in accordance with the rotating speed of the optical disk and the specific signal read out from the optical disk.

SOLUTION: This device is constituted so that the recorded optical disk is rotationally driven by a signal of sector format provided with an address part. The rotation driving state of a spindle motor 16 rotationally driving the optical disk 15 is controlled by a spindle drive signal producing circuit 25 and a system controller 11, and the rotating speed of the spindle motor 16 is detected by an FG signal generator 17. By a pulse generating circuit 24 for detecting the address part, the signal of the address part is detected from a reproduced RF signal from an optical head 14, and the position of a light spot is calculated and detected by an arithmetic circuit 23 and the system controller 11.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the disk-like record-medium driving gear and approach of carrying out revolution actuation of the disk-like record medium.
[0002]
[Description of the Prior Art] Conventionally, although it is in a disk-like record medium variously, the following exists data in record and/or a refreshable disk-like record medium (it is only hereafter called an optical disk) optically, for example. for example, as a rewritable optical disk (erasable) A magneto-optic disk, i.e., MO (Magneto Optical) disk, the so-called MD (mini disc: trademark), There is a phase-change optical disk etc. as a thing recordable once WO (Write Once read many) disk as a still more nearly read-only optical disk For example, there are the so-called CD (Compact Disc: trademark), a CD-ROM (Compact Disc-Read Only Memory) disk, an optical videodisk, etc.
[0003] irradiating the light beam from an optical head on the optical disk concerned by which revolution actuation is carried out in the disk-like record-medium driving gear (it being hereafter called a disk revolution driving gear) which carries out revolution actuation of these optical disks, while carrying out revolution actuation of the above-mentioned optical disk with a spindle motor -- for example, it is made to perform data playback from data logging to the optical disk concerned, or the optical disk concerned. In addition, when the above-mentioned optical disks are the above-mentioned MO disk and MD (trademark), the disk revolution driving gear also has the magnetic head with the above-mentioned optical head as a means for data logging.
[0004] Here, the revolution servo at the time of carrying out revolution actuation of the above-mentioned optical disk, i.e., the revolution servo of the spindle motor which carries out revolution actuation of the optical disk concerned, (it is hereafter called a spindle servo) is divided roughly into the following two methods by the record format of the above-mentioned optical disk.
[0005] One of these is a method which performs a spindle servo based on the specific signal currently recorded on the optical disk. The method concerned is used when the so-called constant linear velocity (CLV:Constant Linear Velocity) and so-called Zone CLV (Zone CLV) are adopted as a record format of the above-mentioned optical disk. As an optical disk with which the method concerned is applied, there are Above CD, a CD-ROM disk, an optical videodisk, MD (trademark), etc., for example. In addition, the above-mentioned zone CLV divides an optical disk into two or more concentric circular zones, and in each zone, a roll control is performed so that it may become a constant linear velocity, respectively. However, the values of the linear velocity for every zone differ.
[0006] Moreover, another side is a method which performs a spindle servo based on FG signal from FG signal generator put side by side to the spindle motor, i.e., the pulse signal from which a pulse generating period changes corresponding to the rotational speed (engine speed per unit time amount) of a spindle motor. The method concerned is used when the so-called constant angular velocity (CAV:Constant Angular Velocity) and so-called Zone CAV (Zone CAV) are adopted as a record format of the above-mentioned optical disk. As an optical disk with which the method concerned is applied,

there are the above-mentioned MO disk, a WO disk, etc., for example. In addition, the above-mentioned zone CAV divides an optical disk into two or more concentric circular zones, and a roll control which serves as a constant angular velocity, respectively is performed in each zone. However, the values of the angular velocity for every zone differ.

[0007]

[Problem(s) to be Solved by the Invention] By the way, the disk revolution driving gear which performs revolution actuation of an optical disk in Above CLV and Zone CLV, Namely, it sets to the disk revolution driving gear which adopted the method which performs a spindle servo based on the specific signal currently recorded on the optical disk. PLL (Phase-Locked Loop: phase-locked loop) is made to lock the specific signal by which record is carried out [above-mentioned] using ejection and the signal concerned of the taken-out specification from the above-mentioned optical disk. It is made to perform the roll control of a spindle motor based on the signal concerned which carried out the PLL lock, i.e., the roll control of an optical disk which serves as a constant linear velocity.

[0008] For this reason, when it seems that it became impossible to take out the above-mentioned specific signal from the above-mentioned optical disk, for example by a focal error or the tracking error, the lock of Above PLL becomes impossible and a spindle servo will become a malfunction.

[0009] Thus, if a spindle servo becomes a malfunction, data logging to the data playback and the optical disk from an optical disk not only becoming impossible but that a revolution of a spindle motor overruns recklessly will occur. When an especially recordable optical disk is used, while performing [for example,] data logging, it will break out that destroy the data already recorded as it occurs that above-mentioned the above-mentioned spindle servo becomes a malfunction and carries out an overrun, or record to record sections other than the record section where data logging should be made is made.

[0010] Furthermore, when the lock of Above PLL separates and a spindle servo becomes a malfunction, in order to have to redo actuation of the spindle servo concerned from the beginning (i.e., in order to have to return spindle servo actuation to an initial start routine), it is hard to say that the access engine performance of the conventional disk revolution driving gear is good.

[0011] Moreover, when performing record and playback of data to the optical disk by which revolution actuation is carried out in Above CLV and Zone CLV, the optical spot for performing record concerned and playback must be arranged in the location on the optical disk which should perform the record and playback. In order in other words to perform record and playback of data to the optical disk by which revolution actuation is carried out in Above CLV or Zone CLV, the location or zone location of the above-mentioned optical spot on the optical disk concerned must be detected.

[0012] Therefore, as mentioned above, after locking Above PLL based on the specific signal reproduced from the optical disk, he reproduces the address information currently recorded on the optical disk concerned, and was trying to detect an optical spot's existence location from this address information in the conventional disk revolution driving gear.

[0013] However, when the above-mentioned optical spot does not exist in accuracy on a truck, the above-mentioned address information cannot be reproduced, either. Since it is narrow, when that the lock of PLL is not made occurs, it becomes impossible moreover, for the capture range of the PLL circuit which constitutes Above PLL to reproduce address information. That is, saying that the address information concerned is unreproducible is saying that the location of an optical spot is also undetectable.

[0014] Since it is such, even if the above-mentioned address information is unreproducible, the technique of the ability to detect the location of an optical spot is desired. In addition, since the constant of PLL must be switched for every zone, if the zone location where an optical spot exists is undetectable, especially in the case of Zone CLV, a constant switch of Above PLL cannot be performed, either, but record and playback of the above-mentioned data will be made to it.

[0015] The disk revolution driving gear which, on the other hand, performs revolution actuation of an optical disk in Above CAV and Zone CAV, In the disk revolution driving gear which adopted the method which in other words performs a spindle servo based on the above-mentioned FG signal Compare the above-mentioned FG signal with a predetermined reference signal, and perform the roll control of a spindle motor so that the pulse period of FG signal and the pulse period of the above-mentioned reference signal may be in agreement. That is, it is made to perform the roll control (spindle servo) of a spindle motor so that the angular rate of rotation of an optical disk may become fixed.

[0016] Here, as mentioned [especially] above in Zone CAV, the angular rate of rotation must be changed for every zone. Since it is such, in the disk revolution driving gear which performs revolution actuation of the optical disk with which the zone CAV concerned is applied, it is setting it as a different value for every zone, and modification of the value of the angular rate of rotation of the pulse period of the above-mentioned reference signal compared with the above-mentioned FG signal is enabled for every above-mentioned zone.

[0017] however, the above for setting up the pulse period of the above-mentioned reference signal according to the location of each zone which is performing record concerned or playback, i.e., the location of the zone where an optical spot exists, in a complicated operation is required and performing sequential record or playback to each zone on the optical disk concerned, in order to change the pulse period of the above-mentioned reference signal -- a complicated operation must be performed serially.

[0018] Moreover, in case data are reproduced from the optical disk concerned, in the disk revolution driving gear which performs revolution actuation of an optical disk in Above CAV and Zone CAV, PLL is made to lock based on the reproduced synchronizing signal concerned, and it is made to reproduce the synchronizing signal recorded at the time of data logging, and to reproduce data.

[0019] However, in the disk revolution driving gear concerned, in case chucking of the above-mentioned optical disk is carried out, it is rare for the center of rotation of the optical disk concerned and the center of rotation of a chucking device to be in agreement with accuracy, therefore the chucking condition for example, at the time of data logging differs also from the chucking condition at the time of data playback in many cases, respectively.

[0020] Thus, when the center of rotation of an optical disk and the center of rotation of a chucking device carry out revolution actuation of the optical disk concerned in the condition of not being in agreement with accuracy, this optical disk will rotate, where eccentricity is carried out. For this reason, when chucking conditions have differed in the time of data logging and data playback as mentioned above, respectively, for example, disk eccentricity conditions will also differ in the time of the above-mentioned data logging and data playback, respectively.

[0021] When disk eccentricity conditions differ in the time of data logging and data playback as mentioned above, for example, it will differ from the linear velocity and the linear velocity in the record location at the time of reproducing the data concerned in the location which recorded a certain data at the time of data logging. Thus, playback of data will become impossible, if there is a possibility that the lock of PLL using a synchronizing signal which was mentioned above at the time of data playback may become impossible when the linear velocity of the same data-logging location comes to change and the lock of Above PLL is not made in the time of data logging and data playback.

[0022] Furthermore, it sets to the disk revolution driving gear which performs revolution actuation of an optical disk in Above CLV, Zones CLV and CAV, or Zone CAV. for example, in case the above-mentioned optical spot is made to seek on the optical disk concerned and data logging or data playback is started The above-mentioned optical spot is promptly moved to the location which should perform the data logging concerned on an optical disk, or data playback, and it must be made for after migration of the optical spot concerned to have to start a spindle servo in the above-mentioned constant linear velocity or a constant angular velocity promptly. In order to enable it to start a spindle servo promptly after such seeking, it is necessary to detect the location of the optical spot on an optical disk correctly and quickly.

[0023] That is, in the case of the spindle servo to the optical disk with which Above CLV and Zone CLV are applied, for example, the disk radial location (zone location where an optical spot exists in the case of Zone CLV) of the above-mentioned optical spot must be detected, and the above-mentioned optical disk must be rotated to it with the rotational speed (engine speed per unit time amount) according to the location where the optical spot concerned exists. In other words, since a revolution of the optical disk concerned must be controlled like to always become a fixed linear velocity (for it to be a constant linear velocity in a zone in Zone CLV) even if the above-mentioned optical spot exists in which radius location on the above-mentioned optical disk, an optical spot's on above-mentioned optical disk existence location must be detected in CLV or Zone CLV.

[0024] Moreover, also in the case of the spindle servo to the optical disk with which Above CAV and Zone CAV are applied, it is necessary to detect the disk radial location (zone location where an optical spot exists in the case of Zone CAV) of the above-mentioned optical spot. Since it is what must change the angular rate of rotation for every zone as mentioned [especially] above in Zone CAV, the zone location where the above-mentioned optical spot exists must be detected, and the above-mentioned optical disk must be rotated by the angular rate of rotation according to the zone location where the optical spot concerned exists.

[0025] Then, this invention is made in view of such a situation, and when the method which performs a spindle servo based on the specific signal currently recorded on the optical disk like CLV or Zone CLV is adopted, it is set. for example, even when it seems that it became impossible to take out a specific signal from an optical disk by a focal error or the tracking error It also aims being able to perform a spindle servo and also raising the access engine performance at offering a possible disk revolution driving gear and a possible approach.

[0026] Moreover, though the linear velocity at the time of data logging and the linear velocity at the time of data playback come to change with change of the chucking condition of an optical disk when the method which performs a spindle servo in this invention based on FG signal like CAV or Zone CAV is adopted, it aims also at offering the disk revolution driving gear and approach of making a spindle servo possible and enabling playback of data.

[0027] Furthermore, in this invention, in order to enable it to start a spindle servo promptly, for example after seeking, it also aims detecting the location on the optical disk of an optical spot to accuracy at offering a possible disk revolution driving gear and a possible approach.

[0028]

[Means for Solving the Problem] The disk-like record-medium driving gear and the approach of this invention solve the technical problem mentioned above by carrying out revolution actuation of the disk-like record medium with which the specific signal which shows the break of a predetermined unit at least was recorded, carrying out revolution actuation of the disk-like record medium, and detecting the reading location on a disk-like record medium based on the rotational speed of a disk-like record medium, and the specific signal read in the disk-like record medium.

[0029] Moreover, by the disk-like record-medium driving gear and approach of this invention, when it lapses into the reading impossible of a specific signal, the technical problem mentioned above is solved by switching the revolution actuation state control of a disk-like record medium to the control based on rotational speed from the control based on a specific signal.

[0030]

[Embodiment of the Invention] Hereafter, the gestalt of desirable operation of this invention is explained, referring to a drawing.

[0031] The example of a configuration of the body of the disk revolution driving gear with which the disk-like record-medium driving gear and approach of this invention are applied and which is the gestalt of 1 operation is shown in drawing 1 . In addition, the disk revolution driving gear of drawing 1 also has the function as a disk record regenerative apparatus it not only to carry out revolution actuation of the disk-like record medium, but to perform record or playback of a signal to the disk-like record medium concerned.

[0032] Moreover, in this example, it is usable in CD (trademark) which are WO disk recordable once and still more nearly read-only optical disks recordable once, such as a magneto-optic disk (MO disk) which is a rewritable optical disk mentioned above as a disk-like record medium, and the so-called MD (trademark), a phase-change optical disk, a CD-ROM disk, an optical videodisk, etc. In the example of drawing 1 , the case where the above-mentioned WO disk is used as an optical disk 15 is mentioned. However, the optical disk 15 in this example may be an optical disk with which any of CLV and Zones CLV and CAV which were mentioned above, and Zone CAV are applied, and the optical disk with

which not only these but the field for CLV and the field for CAV divided independently, and were prepared in the optical disk of one sheet, the optical disk with which the field for Zones CLV and the field for Zones CAV divided independently, and were prepared in the optical disk of one sheet can also be used for it.
[0033] In this drawing 1 , revolution actuation of the above optical disks 15 is carried out by the spindle motor 16. As for the spindle motor 16 concerned, a spindle servo is performed by the spindle drive signal from the spindle drive signal generation circuit 25. In addition, about the detail of the above-mentioned spindle servo by the spindle drive signal generation circuit 25, it mentions later. Moreover, the FG signal generator 17 which outputs FG signal accompanying a revolution of the spindle motor 16 concerned is arranged by this spindle motor 16.
[0034] The optical head 14 consists of optical system which consists of a photodetector which has the light sensing portion of optics, such as laser light sources, such as a laser diode, a collimator lens, an objective lens, a polarization beam splitter, and a multi-lens, and a predetermined pattern, and a biaxial actuator for driving in the horizontal direction of tracking, i.e., the direction, while driving the above-mentioned objective lens in the perpendicular direction of a focus, i.e., the direction. Furthermore, the optical head 14 concerned is made movable in the direction of the diameter of a disk according to the thread device which consists of a thread motor and a thread rail.
[0035] With the optical head 14 concerned, the laser beam by which outgoing radiation was carried out from the above-mentioned laser diode is made into a parallel ray in a collimator lens, and convergent radiotherapy of the parallel ray which minded bending and the polarization beam splitter concerned for the optical path of the above-mentioned parallel ray in the plane of polarization of a polarization beam splitter is carried out on the above-mentioned optical disk 15 with an objective lens. The optical head 14 concerned at this time doubles the above-mentioned focal location on the truck on the above-mentioned disk recording surface by making a focus connect with moving the above-mentioned objective lens in the direction of a focus on the above-mentioned disk recording surface, and moving the above-mentioned objective lens in the direction of tracking with the above-mentioned biaxial actuator. On the other hand, after the reflected light from the above-mentioned optical disk 15 is led to a polarization beam splitter through an objective lens and penetrates the polarization beam splitter concerned, it passes along the condenser lens and cylindrical lens which constitute the above-mentioned multi-lens, and is drawn on the above-mentioned photodetector. In this photodetector, the light drawn the account of a top is changed into an electrical signal by photo electric translation.
[0036] The output signal of the above-mentioned optical head 14 is sent to the focal tracking signal detector 20. In this focal tracking signal detector 20, the focal error signal by the so-called astigmatism method and the tracking error signal by the so-called push pull method are detected from the output signal of the above-mentioned optical head 14, for example. The above-mentioned focal error signal and tracking error signal from the focal tracking signal detector 20 concerned are sent to the servo circuit 21.

[0037] The servo circuit 21 concerned drives the biaxial actuator of the above-mentioned optical head 14 based on the above-mentioned focal error signal and a tracking error signal. That is, both the servo circuits 21 concerned perform actuation control of the biaxial actuator of the optical head 14 so that the above-mentioned focal error signal and the above-mentioned tracking error signal may serve as zero. Thereby, a focus servo and a tracking servo are realized.
[0038] Moreover, the above-mentioned servo circuit 21 also generates the thread driving signal for moving the optical head 14 to the target position of the direction of the diameter of a disk based on the control from a system controller 11, and sends it to the thread driver in which this thread driving signal was formed by the above-mentioned optical head 14. A carrier beam thread driver drives the thread motor of the above-mentioned thread device for the thread driving signal concerned. By this, the above-mentioned optical head 14 will move along with the above-mentioned thread rail.
[0039] In the condition that a spindle servo, a focus servo, and a tracking servo which were mentioned above are made, when recording data on the above-mentioned optical disk 15, the disk revolution driving gear equipment of this example operates as follows.

[0040] First, record data are supplied to a terminal 10 from a host computer, and it is sent to a system controller 11. This system controller 11 controls actuation of the disk revolution driving gear concerned according to the control command from an external host computer while containing the interface function between external instruments. The above-mentioned record data supplied to the system controller 11 concerned are sent to the record digital disposal circuit 12.
[0041] In the record digital disposal circuit 12 concerned, to the above-mentioned record data, predetermined error detecting code and a predetermined error correcting code are added, and predetermined modulation processing for recording on an optical disk 15 further is performed. The record signal outputted from this record digital disposal circuit 12 is sent to the laser modulation circuit 13.
[0042] In the laser modulation circuit 13 concerned, the laser diode of the optical head 14 is driven based on the above-mentioned record signal. The laser power of the laser diode at this time is made by sufficient value to record to the optical disk 15 which is the above-mentioned WO disk. Thereby, record of data is made to an optical disk 15.
[0043] In the condition that a spindle servo, a focus servo, and a tracking servo which were mentioned above are made on the other hand, when reproducing the signal recorded on the above-mentioned optical disk 15, the disk revolution driving gear of this example operates as follows.
[0044] The light which the above-mentioned optical head 14 irradiated on the above-mentioned optical disk 15, and was reflected with the optical disk 15 concerned is drawn on a photodetector, as mentioned above. In this photodetector, the record signal of the above-mentioned optical disk 15 is taken out by changing into an electrical signal the light drawn the account of a top by photo electric translation.
[0045] The output signal from the above-mentioned optical head 14 is sent to the RF amplifier circuit 18 as a RF signal. In this RF amplifier circuit 18, the RF signal from the above-mentioned optical head 14 is amplified, and it sends to the regenerative-signal processing circuit 19.
[0046] In the regenerative-signal processing circuit 19 concerned, since said predetermined modulation is performed, the signal recorded on the above-mentioned optical disk 15 gives the recovery corresponding to the above-mentioned predetermined modulation to the signal from the above-mentioned RF amplifier circuit 18, and performs further the error detection processing and error correction processing using the error detecting code and the correction sign which are added to said record data. In addition, this regenerative-signal processing circuit 19 includes the PLL circuit for extracting a bit clock from the RF signal which played and obtained the above-mentioned optical disk 15.
[0047] The signal with which a recovery, error detection, and correction processing were made is further sent by the regenerative-signal processing circuit 19 concerned to an external configuration, for example, a host computer, through a terminal 10 through a system controller 11.
[0048] Next, although actuation of the spindle servo in the disk revolution driving gear of this example and location detection actuation of the optical spot on an optical disk 15 are explained The optical disk 15 with which said CLV and CAV, Zone CLV, or Zone CAV is applied before that in order to make an understanding of these explanation easy, Relation with the sector format at the time of data logging over each [these] optical disk 15 and the relation between the optical spot location on each [these] optical disk 15 and FG signal outputted from the above-mentioned FG generator 17 are explained.
[0049] The relation between each above-mentioned optical disk 15 and the above-mentioned sector format is explained.
[0050] Here, although it is in sector format variously, it is made with a configuration as fundamentally shown in drawing 2 .
[0051] That is, in drawing 2 , the sector format of the record data concerned consists of address part, the flag section, data division, and the buffer section. The above-mentioned address part expresses the physical address on the head of a sector, and the disk of a sector, and it expresses whether this sector already writes in the above-mentioned flag section, and it is ending, it is a defective sector, or it is the already eliminated sector. Moreover, the above-mentioned data division are fields where user data are written in, and even if the above-mentioned buffer section has revolution fluctuation of an optical disk

15 when writing data in a data area for example, it is a field not to perform the writing of data at the head of the address part of the following sector. Of course, although this sector format is an example and various things can otherwise be considered, the sector format of the optical disk 15 of this example has the specific signal (this example the above-mentioned address part) which shows the head of the above-mentioned sector as what shows the unit break of record anyway.

[0052] It seems that therefore, the record pattern on the optical disk 15 with which sector format like above-mentioned drawing 2 was applied is shown in drawing 3 thru/or drawing 5 . The example of arrangement of the record section EA of the above-mentioned address part allotted by Above CLV on the truck tr on the optical disk 15 by which revolution actuation is carried out, and the truck tr concerned is shown in drawing 3 , and, similarly the example of arrangement of the truck tr on the optical disk 15 by which revolution actuation is carried out again at drawing 5 in Zone CLV or Zone CAV in the example of arrangement of the truck tr on the optical disk 15 by which revolution actuation is carried out by Above CAV, and the record section EA of address part, and the record section EA of address part is shown in drawing 4 .

[0053] That is, in the case of the optical disk 15 by which revolution actuation is carried out by Above CLV, even if the physical spacing DS of the record section EA of the above-mentioned address part allotted on the truck tr spirally formed as shown in drawing 3 is which radius location on the disk 15 concerned, it becomes the same altogether.

[0054] On the other hand, in the case of the optical disk 15 by which revolution actuation is carried out by Above CAV, the physical spacing DS of the record section EA of the above-mentioned address part allotted on the truck tr spirally formed as shown in drawing 4 turns into the narrow spacing DSI by the inner circumference side of the optical disk 15 concerned, and turns into the large spacing DSO by the periphery side.

[0055] Furthermore, since linear velocity differs between said zones in the case of the optical disk 15 by which revolution actuation is carried out in the above-mentioned zone CLV, but revolution actuation is made so that it may become fixed in each zone, the physical spacing DS of the record section EA of the above-mentioned address part allotted on the truck tr spirally formed as shown in drawing 5 becomes the same in each zone, and, on the other hand, differs between each zone. In addition, in the example of drawing 5 , the case where the concentric circular field which consists of three adjoining trucks, for example is made into one zone is illustrated.

[0056] moreover, the case of the optical disk 15 by which revolution actuation is carried out in the above-mentioned zone CAV -- physical arrangement of the record section EA of the above-mentioned address part on the optical disk 15 concerned -- above-mentioned drawing 5 and **** -- it becomes the same. That is, in the case of the optical disk 15 by which revolution actuation is carried out in the above-mentioned zone CAV, although angular velocity differs between said zones, since revolution actuation is carried out so that it may become fixed, in each zone, the record section EA of the above-mentioned address part allotted on the truck tr spirally formed like drawing 5 is equal to the disk radial, and is arranged in each zone. Moreover, in each zone, since it is made by the constant angular velocity, in the truck tr by the side of the inner circumference in one zone, physical spacing of the above-mentioned record section EA becomes narrow, and turns into large spacing by truck tr by the side of a periphery.

[0057] As mentioned above, even if it is the case where any of CLV, CAV, Zone CLV, and Zone CAV are applied, on the optical disk 15, the record section EA of the above-mentioned address part is arranged. In addition, in the case of the optical disk 15 in which record like said MO disk and WO disk is possible, the signal of the above-mentioned address part is recorded also on the non-record section by the preformat.

[0058] Therefore, in the RF signal which played the above-mentioned optical disk 15 by the above-mentioned optical head 14, the signal SA reproduced from the record section EA of the above-mentioned address part as shown in drawing 6 will surely be included. In addition, the example of a wave of the RF signal reproduced from the optical disk 15 with which data are already recorded is shown in (A) of drawing 6 , and the signal SD of the record section of said data division and the signal SA of the record section EA of the above-mentioned address part are included in the RF signal shown in

(A) of the drawing 6 concerned. Moreover, the RF signal reproduced from the non-record section of an optical disk 15 is shown in (B) of drawing 6 , and the signal SA of the record section EA of the above-mentioned address part is included also in the RF signal shown in (B) of this drawing 6 .
[0059] Here, when the optical disk 15 in which revolution actuation is carried out by said CLV is played, time spacing of the signal SA of the above-mentioned address part becomes fixed. Moreover, when the optical disk 15 by which revolution actuation is carried out in said zone CLV is played, although time spacing of the signal SA of the above-mentioned address part differs between each zone, it becomes fixed in each zone. In in other words carrying out revolution actuation of the optical disk 15 of these CLV and Zone CLV, it is made to perform the control which makes regularity time spacing of the signal SA of the above-mentioned address part currently recorded on the optical disk 15 concerned, i.e., a spindle servo which rotates the optical disk 15 concerned so that it may become a constant linear velocity (it is a constant linear velocity in a zone in the case of Zone CLV). In addition, in a actual spindle servo, the roll control of a spindle motor is performed based on the signal which made PLL lock the signal SA of the above-mentioned address part using the signal SA of ejection and the address part concerned from the RF signal which played and obtained the above-mentioned optical disk 15, and made the PLL concerned lock.
[0060] On the other hand, when the optical disk 15 in which revolution actuation is carried out by said CAV is played, time spacing of the signal SA of the above-mentioned address part reproduced from the disk inner circumference side becomes short, and time spacing of the signal SA of the above-mentioned address part reproduced from the disk periphery side becomes long. Furthermore, between each zone, when the optical disk 15 by which revolution actuation is carried out in said zone CAV is played, although time spacing of the signal SA of the above-mentioned address part differs, it becomes fixed in each zone. Moreover, in the case of the zone CAV concerned, time spacing of the signal SA of the above-mentioned address part reproduced from the truck tr by the side of the inner circumference in a zone becomes short, and time spacing of the signal SA of the above-mentioned address part reproduced from the truck tr by the side of the periphery in a zone becomes long.
[0061] On the other hand, when the optical disk 15 in which revolution actuation is carried out by Above CAV is played, the pulse period of FG signal generated from the above-mentioned FG generator 17 with a revolution of said spindle motor 16 becomes fixed. Moreover, when the optical disk 15 by which revolution actuation is carried out in said zone CAV is played, the pulse period of FG signal generated from the above-mentioned FG generator 17 becomes fixed for every zone. In in other words carrying out revolution actuation of the optical disk 15 in these CAV and Zone CAV, it is made to perform the control which makes regularity the pulse period of the above-mentioned FG signal, i.e., a spindle servo which rotates an optical disk 15 so that it may become a constant angular velocity. In addition, in this case, a actual spindle servo compares the above-mentioned FG signal with a predetermined reference signal, and it carries out the roll control of the spindle motor 16 so that the pulse period of FG signal and the pulse period of the above-mentioned reference signal may be in agreement. Moreover, in playing the optical disk 15 which carries out revolution actuation in Above CAV and Zone CAV, the synchronizing signal recorded at the time of data logging is reproduced, and PLL is made to lock based on the reproduced synchronizing signal concerned, and it is made to reproduce data.
[0062] Next, the relation between the signal SA of the above-mentioned address part reproduced by the relation between the optical spot location formed on each optical disk 15 of said CLV and CAV, Zone CLV, and Zone CAV and FG signal outputted from the above-mentioned FG generator 17, i.e., the optical spot formed on each optical disk 15, from Truck tr and the above-mentioned FG signal with which a pulse generating period changes corresponding to the rotational speed of the above-mentioned spindle motor 16 explains.
[0063] Although time spacing of the signal SA of address part becomes fixed, without calling at the location of the truck tr currently reproduced on the above-mentioned optical disk 15, i.e., the disk radial location of the optical spot currently formed on the optical disk 15, as mentioned above when carrying out revolution actuation of the optical disk by said CLV, the pulse period of FG signal generated from

said FG generator 17 changes according to the location of the above-mentioned optical spot. For example, the pulse period of FG signal in case an optical spot location is in the periphery side of an optical disk 15 is long, and, as for the pulse period of FG signal at that time, an optical spot location becomes short at the inner circumference side of an optical disk 15. Conversely, if it says and the pulse period of the above-mentioned FG signal will be measured, it will be turned out whether the above-mentioned optical spot exists on which [of an optical disk 15] radius location.

[0064] When similarly carrying out revolution actuation of the optical disk 15 by the above-mentioned zone CLV as shown in said drawing 5 , the pulse period of the above-mentioned FG signal changes according to the zone location where an optical spot exists on the above-mentioned optical disk 15. Conversely, if it says, also when carrying out revolution actuation of the optical disk 15 by Zone CLV, if the pulse period of the above-mentioned FG signal is measured, it will be turned out whether the above-mentioned optical spot exists on which [of an optical disk 15] zone location.

[0065] On the other hand, although it becomes fixed [the pulse period of FG signal generated from the above-mentioned FG generator 17] as mentioned above when carrying out revolution actuation of the optical disk 15 by said CAV, time spacing of the signal SA of the above-mentioned address part will change according to the location (radius location) where an optical spot exists on the above-mentioned optical disk 15. Therefore, if it measures time spacing of the signal SA of the above-mentioned address part in driving an optical disk 15 in the CAV concerned, it will be turned out whether the above-mentioned optical spot exists on which [of an optical disk 15] radius location.

[0066] Similarly, when carrying out revolution actuation of the optical disk 15 by said zone CAV, time spacing of the signal SA of the above-mentioned address part will change according to the zone location where an optical spot exists on the above-mentioned optical disk 15. Therefore, if it measures time spacing of the signal SA of the above-mentioned address part in driving an optical disk 15 in the zone CAV concerned, it will be turned out whether the above-mentioned optical spot exists on which [of an optical disk 15] zone location.

[0067] As mentioned above, in carrying out revolution actuation of the optical disk 15 by Above CLV and Zone CLV where time spacing of the signal SA of the above-mentioned address part becomes fixed By measuring the pulse period of the above-mentioned FG signal, the location (a radius location or zone location) where an optical spot exists on the above-mentioned optical disk 15 is detectable. In carrying out revolution actuation of the optical disk 15 by Above CAV and Zone CAV where the pulse period of the above-mentioned FG signal becomes fixed on the other hand By measuring time spacing of the signal SA of the above-mentioned address part, the location (a radius location or zone location) where an optical spot exists on an optical disk 15 is detectable.

[0068] If it becomes common more and it explains, and time spacing of the signal SA of the above-mentioned address part will be set to TS and TS/TFG will be calculated by setting the pulse period of FG to TFG, the operation value of the TS/TFG concerned will become large as it is small and goes to a periphery side by the inner circumference side of an optical disk 15. Therefore, if the relation between each operation value of these TS/TFG and each location (a radius location or each zone location) where an optical spot exists on an optical disk 15 is matched When Above TS uses the above CLV made uniformly and Zone CLV By measuring the pulse period TFG of the above-mentioned FG signal, and calculating TS/TFG, the location on the optical disk 15 with which the above-mentioned optical spot exists (a radius location or zone location) is uniquely detectable. On the other hand, when Above TFG uses the above CAV made uniformly and Zone CAV, the location on the optical disk 15 with which the above-mentioned optical spot exists (a radius location or zone location) can be uniquely detected by measuring the spacing SA of the signal SA of the above-mentioned address part, and calculating TS/TFG.

[0069] Namely, it sets to the disk revolution driving gear of this example. In having beforehand the conversion table of above-mentioned TS/TFG and the optical spot location on an optical disk 15 and carrying out revolution actuation of the above-mentioned optical disk 15 in CLV and Zone CLV Above-mentioned TS/TFG is calculated from the spacing TS of the signal of the above-mentioned address part controlled by constant value, and the pulse period TFG of the above-mentioned FG signal which changes according to an optical spot location, and optical spot location detection is performed from the operation value of the TS/TFG concerned, and the above-mentioned conversion table. On the other hand, in carrying out revolution actuation of the optical disk 15 in CAV and Zone CAV, above-mentioned TS/TFG is calculated from the spacing TS of the signal SA of the above-mentioned address part which changes according to the location of an optical spot, and the pulse period TFG of the above-mentioned FG signal controlled by constant value, and it performs the above-mentioned optical spot location detection from the operation value of the TS/TFG concerned, and the above-mentioned conversion table.

[0070] Thus, with the disk revolution driving gear of this example, even if it is which optical disk 15 of CLV, Zones CLV and CAV, and Zone CAV, detection of an optical spot location is realized by performing an easy operation called such mere division only using two parameters, the spacing TS of the signal SA of the above-mentioned address part, and the pulse period TFG of FG signal.

[0071] Explanation about concrete actuation of the disk revolution driving gear of this example which realizes location detection of the optical spot mentioned above is given to below.

[0072] It returns to drawing 1 , and the RF signal from said RF amplifier 18 is sent also to the address part detection pulse generating circuit 24 at the same time it is sent to said regenerative-signal processing circuit 19.

[0073] In the address part detection pulse generating circuit 24 concerned, the signal SA of said address part is extracted from the above-mentioned RF signal, and the pulse (it is hereafter called an address part detection pulse) corresponding to the signal SA concerned is generated.

[0074] This address part detection pulse is sent to an arithmetic circuit 23. FG signal from said FG generator 17 is also supplied to the arithmetic circuit 23 concerned. In this arithmetic circuit 23, said TS/TFG is calculated from the pulse periods TS and TFG which measured the pulse period of the above-mentioned address part detection pulse, i.e., the spacing TS of the signal SA of said address part (the pulse period of the address part detection pulse concerned is hereafter set to TS) and the pulse period TFG of the above-mentioned FG signal, and were these-measured further, and the value of this result of an operation is sent to a system controller 11.

[0075] The system controller 11 concerned detects the location (the case of Zone CAV and Zone CLV zone location) of the optical spot on the above-mentioned optical disk 15 based on the value of the result of an operation of above-mentioned TS/TFG. That is, in addition, the thing which the above-mentioned system controller 11 is equipped with the ROM table which matched beforehand the relation of an each value of above-mentioned TS/TFG and the optical spot location (the radius location or each zone location) which was mentioned above, for example, and perform finding out the optical spot location according to the operation value of above-mentioned TS/TFG out of the ROM table concerned and for which an operation detects the above-mentioned optical spot location from the value of the result of an operation of TS/TFG instead of a ROM table is also possible.

[0076] The operation of TS/TFG in the above-mentioned arithmetic circuit 23 and actuation of the optical spot location detection by the above-mentioned system controller 11 can be expressed with a flow chart like drawing 7 .

[0077] In this drawing 7 , at a step ST 30, the pulse of the above-mentioned FG signal from the above-mentioned FG signal generator 17 is inputted into the above-mentioned arithmetic circuit 23, and it sets to the arithmetic circuit 23 concerned at the following step ST 31, and is ****** about the pulse period TFG from the above-mentioned FG signal. Moreover, at a step ST 32, the above-mentioned address part detection pulse from the above-mentioned address part detection pulse generating circuit 24 is inputted into the above-mentioned arithmetic circuit 23, and measures the pulse period TS of the above-mentioned address part detection pulse in the arithmetic circuit 23 concerned in the following step ST 33.

[0078] Next, at a step ST 34, the above-mentioned arithmetic circuit 23 calculates said TS/TFG using the pulse period TS of the above-mentioned address part detection pulse, and the pulse period TFG of the above-mentioned FG signal.

[0079] At a step ST 35, the above-mentioned system controller 11 performs detection of the radius location of an optical spot,.or a zone location using the value of the result of an operation of above-mentioned TS/TFG.

[0080] Moreover, the above-mentioned system controller 11 sends out the drive control signal for performing directions of whether to carry out revolution actuation of the above-mentioned optical disk 15 in Above CLV, Zones CLV and CAV, or Zone CAV, and directions of whether to rotate the above-mentioned optical disk 15 with which rotational speed based on the detection location of the optical spot which carried out [above-mentioned] detection to said spindle drive signal generation circuit 25.

[0081] The spindle drive signal generation circuit 25 concerned carries out revolution actuation of the above-mentioned spindle motor 16 according to the drive control signal from the above-mentioned system controller 11. Moreover, as for the spindle drive signal generation circuit 25 concerned, the reference clock from a crystal oscillator 22 and the address part detection pulse from the above-mentioned address part detection pulse generating circuit 24 are also supplied besides the drive control signal from the above-mentioned system controller 11.

[0082] When said CLV is specified by the drive control signal from the above-mentioned system controller 11, here in the above-mentioned spindle drive signal generation circuit 25 The pulse period of the above-mentioned address part detection pulse is measured using the above-mentioned reference clock (count). When the pulse period of the address part detection pulse concerned is more than a regular period (counted value), the rotational speed of the above-mentioned spindle motor 16 is made to increase according to the difference. Conversely, when not fulfilling a regular period (counted value), a spindle drive signal which decreases the rotational speed of the above-mentioned spindle motor 16 by the difference is generated. When said zone CLV is specified by the above-mentioned drive control signal, moreover, in the above-mentioned spindle drive signal generation circuit 25 The pulse period of the above-mentioned address part detection pulse is measured using the above-mentioned reference clock for every zone (count). When it is more than the period (counted value) as which the pulse period of the address part detection pulse concerned was specified for every zone, the rotational speed of the above-mentioned spindle motor 16 is made to increase according to the difference. On the contrary, when not fulfilling the period (counted value) specified for every zone, a spindle drive signal which decreases the rotational speed of the above-mentioned spindle motor 16 by the difference is generated.

[0083] When said CAV is specified by the above-mentioned drive control signal, on the other hand, in the above-mentioned spindle drive signal generation circuit 25 The pulse period of the above-mentioned FG signal is measured using the above-mentioned reference clock (count). When the pulse period of the FG signal concerned is more than a regular period (counted value), the rotational speed of the above-mentioned spindle motor 16 is made to increase according to the difference. Conversely, when not fulfilling a regular period (counted value), a spindle drive signal which decreases the rotational speed of the above-mentioned spindle motor 16 by the difference is generated. When said zone CAV is specified by the above-mentioned drive control signal, moreover, in the above-mentioned spindle drive signal generation circuit 25 The pulse period of the above-mentioned FG signal is measured using the above-mentioned reference clock for every zone (count). When it is more than the period (counted value) as which the pulse period of the FG signal concerned was specified for every zone, the rotational speed of the above-mentioned spindle motor 16 is made to increase according to the difference. On the contrary, when not fulfilling the period (counted value) specified for every zone, a spindle drive signal which decreases the rotational speed of the above-mentioned spindle motor 16 by the difference is generated.

[0084] By the way, as mentioned above, when carrying out revolution actuation of the optical disk 15 in CLV and Zone CLV and reading of the signal SA of the above-mentioned address part becomes impossible, a spindle servo serves as a malfunction and a spindle motor 16 will hang up.

[0085] for this reason, in the disk revolution driving gear of this example When carrying out revolution actuation of the optical disk 15 in CLV and Zone CLV and reading of the signal SA of the above-mentioned address part becomes impossible From the mode (it is hereafter called address pulse servo mode) using the signal SA of said address part, the mode of a spindle servo by switching to the mode (it being hereafter called FG pulse servo mode) using said FG signal It is also performing preventing a spindle motor 16 hanging up.

[0086] That is, when it carries out like the flow chart shown in the following drawing 8 and drawing 9 and reading of the signal SA of the above-mentioned address part becomes impossible, he is trying to switch the mode of a spindle servo to said FG pulse servo mode in the disk revolution driving gear of this example. Moreover, the signal wave form of the body in the disk revolution driving gear at the time of performing actuation of the drawing 8 concerned and drawing 9 is shown in drawing 10 thru/or drawing 12 .

[0087] In drawing 8 , in carrying out revolution actuation of the optical disk 15 in Above CLV and Zone CLV, when said system controller 11 controls said spindle drive signal generation circuit 25, and a spindle servo is turned ON as shown in a step ST 1, and said system controller 11 controls said servo circuit 21, as shown in a step ST 2, it turns ON a focus servo. In addition, it is because the writing to the WO disk concerned will be made even if it compares to turning ON a spindle servo previously in this way, and turning ON a focus servo since an optical disk 15 is rotated turning ON a focus servo previously case [whose optical disk 15 is / like for example WO disk] and laser power is the power for playback.

[0088] Here, though the above-mentioned spindle servo turns on and the focus servo is turned on, when tracking is not made good, for example, a normal RF signal is not reproduced from the above-mentioned optical disk 15. Thus, when a RF signal is not reproduced normally, reading of the signal SA of address part cannot be performed, either and the spindle servo using the signal SA of address part which was mentioned above is not made. For this reason, with the above-mentioned system controller 11, it has judged whether the RF signal was detected like a step ST 3 by observing the output signal from the above-mentioned regenerative-signal processing circuit 19. When it judges with the above-mentioned RF signal not being detected in decision at the above-mentioned step ST 3, the above-mentioned system controller 11 controls the above-mentioned spindle drive signal generation circuit 25, and makes the mode of a spindle servo said FG pulse servo mode like a step ST 5.

[0089] If the above-mentioned system controller 11 goes into the above-mentioned FG pulse servo mode, it will be standing by only for t seconds of fixed time amount set up beforehand like a step ST 6, and will wait to reproduce a RF signal from the above-mentioned optical disk 15.

[0090] After this t second standby judges whether the RF signal was again detected like a step ST 7. When the RF signal is not yet detected at this step ST 7, it returns to a step ST 5 and the same processing as the above is repeated. On the other hand, when a RF signal is detected in a step ST 7, it progresses to processing of a step ST 8.

[0091] At this step ST 8, said address part detection pulse comes to be generated from said address part detection pulse generating circuit 24. That is, in said address part detection pulse generating circuit 24, the signal SA of said address part contained in the RF signal supplied from the above-mentioned RF amplifier circuit 18 is extracted, and an address part detection pulse is generated and outputted. The address part detection pulse concerned is sent to the above-mentioned spindle drive signal generation circuit 25.

[0092] Here, in the spindle drive signal generation circuit 25 in case close is in FG pulse servo mode like the above-mentioned step ST 5, as shown in a step ST 9, all the address part detection pulses included in the above-mentioned FG signal are confirmed. After the step ST 9 concerned progresses to a step ST 10.

[0093] In addition, when the RF signal is detected from the beginning in said step ST 3, as shown in a step ST 4, in the above-mentioned address part detection pulse forming network 20, the signal SA of address part is extracted from the above-mentioned RF signal, and an address part detection pulse is generated and outputted. The address part detection pulse generated in this step ST 4 is also sent to the above-mentioned spindle drive signal generation circuit 25.

[0094] In the above-mentioned spindle drive signal generation circuit 25 to which the address part detection pulse generated as mentioned above was supplied, as shown in a step ST 10, spacing (pulse period) of the above-mentioned address part detection pulse is measured in said reference clock (count), the measured value (counted value n) is calculated, and it asks for the difference (m-n) of the above-mentioned counted value n and the period (counted value m) of said convention in a step ST 11 further.

then, the step ST 12 -- setting -- the data of the count result of the difference (m-n) concerned -- for example, digital one / analog (D/A) conversion is carried out, and it outputs to said spindle motor 16 by making into said spindle drive signal the electrical-potential-difference value acquired by this D/A. After the above-mentioned step ST 12 progresses to processing of the step ST 13 of the flow chart of drawing 9 .

[0095] At this step ST 13, in the above-mentioned spindle drive signal generation circuit 25, a window is set up virtually, and it judges whether the falling edge of the above-mentioned address part detection pulse exists in the window concerned. The window at this time is generated based on said FG signal. Therefore, the falling edge of the above-mentioned address part detection pulse does not necessarily surely enter in the window concerned. The above-mentioned spindle drive signal generation circuit 25 sets a window flag to "0", as it is shown in a step ST 15, when it judges with the falling edge of an address part detection pulse not existing in a window in the step ST 13 concerned, and on the other hand, if it judges with the address part detection pulse having existed in the window concerned, as shown in a step ST 14, it will stand "1" to a window flag.

[0096] Here, it judges whether like a step ST 16, the above-mentioned spindle drive signal generation circuit 25 followed the above-mentioned window flag, and N time"1" stood. That is, when 5 times is mentioned as the above-mentioned N time, it judges whether the above-mentioned spindle drive signal generation circuit 25 followed the above-mentioned window flag, and "1" stood 5 times. When N time"1" does not stand succeeding the above-mentioned window flag, it returns to processing of the step ST 10 of the flow chart of said drawing 8 . On the other hand, when N time"1" stands succeeding the above-mentioned window flag, from the spindle drive signal generation circuit 25 concerned, the signal which shows that is sent to said system controller 11.

[0097] The system controller 11 which received the signal concerned is made to shift to the address pulse servo mode in which the mode of the spindle servo of the disk revolution driving gear concerned was mentioned above, by controlling the above-mentioned spindle drive signal generation circuit 25 to be shown in a step ST 17.

[0098] If it goes into the address pulse servo mode concerned, when revolution actuation of the optical disk 15 is carried out in CLV or Zone CLV, the window corresponding to the location in which the signal SA of address part should exist essentially within a RF signal will be set up in the above-mentioned spindle drive signal generation circuit 25. In addition, it carries out setting up a window within the above-mentioned RF signal in this way corresponding to the location where the signal SA of address part should exist essentially to calling it the lock of a window hereafter, and the condition concerned of not being locked will be called unlocking. Therefore, the window virtually set up based on said FG signal will be called window of the above-mentioned unlocking condition.

[0099] The above-mentioned spindle drive signal generation circuit 25 confirms only the address part detection pulse which exists in the locked window concerned among the address part detection pulses extracted from the above-mentioned RF signal. That is, it judges whether the falling edge of an address-part detection pulse exists in the locked window concerned, and as the above-mentioned spindle drive signal generation circuit 25 shows to a step ST 19, when it judges with the falling edge of an address part detection pulse existing in the locked window concerned, the spindle drive signal for performing a spindle servo based on the address-part detection pulse concerned, as shown in a step ST 20 generates and outputs.

[0100] On the other hand, when it judges with the falling edge of an address part detection pulse not existing in the locked window concerned at a step ST 19, as shown in a step ST 21, "1" is stood to a pulse flag. Thus, saying that "1" stands on a pulse flag means things for the signal SA of address part not existing in the location which should be in the window concerned, i.e., a RF signal, essentially.

[0101] The spindle drive signal generation circuit 25 when "1" stands on the pulse flag concerned judges whether "1" stood M times succeeding the pulse flag concerned, as shown in a step ST 22. M times at this time are a larger number than said N time, and mentions 30 times as the M times concerned in this example. Therefore, it judges whether the above-mentioned spindle drive signal generation circuit 25 followed the above-mentioned pulse flag, and "1" stood 30 times.

[0102] Saying that the above-mentioned pulse flag's is followed and "1" stands M times here is that an address part detection flag does not exist M times succeeding the inside of the window by which the lock was carried out [above-mentioned], and it means that this does not have the signal SA of the address part concerned in the location in which the signal SA of address part should exist essentially within the above-mentioned RF signal. That is, the spindle servo according [this] to the signal SA of the above-mentioned address part means that it is a malfunction.

[0103] For this reason, when judged with yes at the above-mentioned step ST 22, the signal which shows that from the spindle drive signal generation circuit 25 concerned is sent to said system controller 11, and the system controller 11 which received the signal concerned returns the mode of the spindle servo of the disk revolution driving gear concerned to said FG pulse servo mode by controlling the above-mentioned spindle drive signal generation circuit 25, as shown in said step ST 5.

[0104] On the other hand, when "1" does not stand M times in the above-mentioned step ST 22 succeeding the pulse flag, namely, although "1" may stand on a pulse flag, when "1" does not stand M times continuously A part of signal SA of each address part which exists in the above-mentioned FG signal thinks that it has escaped by a certain reason. In the above-mentioned spindle drive signal generation circuit 25 As shown in a step ST 23, an address part detection pulse and the same pulse are interpolated in the part corresponding to the pulse flag the "1" concerned stood.

[0105] After processing of the above-mentioned step ST 20 and a step ST 23 returns to processing of the step ST 10 of drawing 8 . That is, in the above-mentioned spindle drive signal generation circuit 25, revolution actuation of a spindle motor 16 is performed using any of the address part detection pulse to which interpolation of the pulse was carried out at the address part detection pulse used as it was at the above-mentioned step ST 20, or the above-mentioned step ST 23.

[0106] An example of the signal wave form of the body of the disk revolution driving gear of this example when processing the flow chart of drawing 8 mentioned above and drawing 9 comes to be shown in drawing 10 thru/or drawing 12 .

[0107] The RF signal outputted from the above-mentioned RF amplifier circuit 18, the address part detection pulse which the above-mentioned address part detection pulse generating circuit 24 generated, the condition of the signal of the above-mentioned window used in the above-mentioned spindle drive signal generation circuit 25 and its lock, or unlocking, and the condition in the mode of a spindle servo are shown in these drawing 10 thru/or drawing 12 .

[0108] Moreover, the signal wave form at the time of setting up an imagination window (window of an unlocking condition) in the step ST 13 of the flow chart of said drawing 9 is shown, a spindle servo becomes a malfunction at drawing 12 at the time of said address pulse servo mode about the signal wave form at the time of the window concerned being locked from the window of an unlocking condition, and the signal wave form at the time of shifting to said FG pulse servo mode is shown in drawing 11 at drawing 10 . In addition, the RF signal of drawing 10 thru/or drawing 12 is omitting the signal SD of the record section of said data division, in order to simplify a graphic display.

[0109] the above -- in drawing 10 which shows the signal wave form at the time of setting up an imagination window, the disk revolution driving gear of this example will judge the existence of the address part detection pulse generated from the signal SA of the address part of a RF signal like the step ST 13 of above-mentioned drawing 8 using the imagination window concerned, if said imagination window is set up from the point shown all over [w0] drawing starting [window]. here, if five falling edges of an address part detection pulse continue in the window concerned and exist, it will move from the window concerned to a lock condition from an unlocking condition -- things -- ** However, in the example of drawing 10 , it is four continuation in [w1-w4] drawing that the falling edge of an address part detection pulse existed in the window concerned, and the falling edge of the above-mentioned address part detection pulse does not exist in the 5th window shown all over [w5] drawing. In this case, the imagination window concerned is once reset and is again reset up from the window restart point shown all over [w6] drawing. Like the example of this drawing 10 , when a window continues being in an unlocking condition, the mode of a spindle servo serves as as [said FG pulse servo mode].

[0110] Next, in drawing 11 , as shown in the step ST 16 of said drawing 9 , supposing the above-mentioned address part detection pulse continues and recognizes N time (for example, 5 times) existence of the disk revolution driving gear of this example into the window (imagination window) of an unlocking condition, it will be the timing of a window, for example, a standup, to have address part detection existed [of eye the N time concerned], and the above-mentioned window will shift to a lock condition from an unlocking condition. That is, when existence of the 5th address part detection pulse is checked in the window shown, for example all over [w5] drawing, the above-mentioned window is made to shift to a lock condition from an unlocking condition with the disk revolution driving gear of this example, the window, for example, the timing which starts, in [w5] the drawing concerned. Simultaneously, the mode of a spindle servo shifts to address pulse servo mode from said FG pulse servo motor, as shown in the step ST 17 of drawing 9 . Here, when the signal SA of the address part in a RF signal cannot be taken out normally and generation of an address part detection pulse is not performed when the window is locked as mentioned above for example, an address part detection pulse will not exist in a window. The example to which the address part detection pulse does not exist in the window shown by wX+1 among drawing is given in drawing 11. Thus, when that generation of an address part detection pulse is not performed breaks out without the ability of the signal SA of address part taking out normally, there is a possibility that it may become impossible to perform the spindle servo based on the address part detection pulse concerned. Even if the above-mentioned address part detection pulse stops existing in a window, he does not perform what a window is immediately changed into an unlocking condition and returns spindle servo mode to FG pulse servo mode, but is trying to interpolate the address part detection pulse of the location corresponding to the window shown by the above-mentioned wX+1 like said step ST 23 for example, by front-end hold in the disk revolution driving gear of this example. In this example, as a count of allowance which can perform such a front-end hold continuously, as mentioned above, M times (for example, 30 times) are set up, and if it is these less than M times, it will be made to perform the front-end hold of an address part detection pulse. He is trying for it not to occur that the above-mentioned address pulse servo mode and FG pulse servo mode change frequently because the disk revolution driving gear of this example interpolates an address part detection pulse by front-end hold in this way.

[0111] Moreover, as mentioned above also as the number of allowance of the count to which an address part detection pulse continues and does not exist in the window by which the lock is carried out [above-mentioned], it is set as M times (for example, 30 times), and only when these M times are exceeded, he is trying to switch the mode of the above-mentioned spindle servo to FG pulse servo mode from address pulse servo mode in this example like the step ST 22 of said drawing 9 , and the step ST 5 of drawing 8 . That is, as shown all over [w1-w30] drawing of drawing 12 , when an address part detection pulse will not recognize M continuation (30 times) existence into the window by which the lock was carried out [above-mentioned], he is trying to switch the mode of a spindle servo to FG pulse servo mode from the above-mentioned address pulse servo mode. Thus, after processing the flow chart of said drawing 8 , it is made to return to the above-mentioned address pulse servo mode like the step ST 6 of said drawing 8 , after standing by only for t seconds when switched to FG pulse servo mode.

[0112] Even when it seems that it became impossible to take out the signal SA of address part from an optical disk 15 by a focal error or the tracking error while carrying out revolution actuation of the optical disk 15 in CLV or Zone CLV by performing detection and a spindle servo of an optical spot location which were mentioned above according to the disk revolution driving gear of this example, a spindle servo with high stability and dependability can be performed.

[0113] Moreover, according to the disk revolution driving gear of this example, while carrying out revolution actuation of the optical disk 15 in CAV or Zone CAV, for example, though the linear velocity at the time of data logging and the linear velocity at the time of data playback come to change with change of the chucking condition of a disk, a reliable spindle servo becomes possible and it becomes record of data, and reproducible.

[0114] Furthermore, according to the disk revolution driving gear of this example, in order to enable it to start a spindle servo promptly after seeking, it also becomes possible to detect the location on the optical disk of an optical spot to accuracy, and it becomes possible to also raise the access engine

performance of it. Moreover, only using said two parameters, TS and TFG, the location of an optical spot is detectable only by the easy operation of said TS/TFG, and in the case of software, it can realize by the small number of steps, and it can realize these optical spot location detection with the easy configuration also in the case of hardware.
[0115] In addition, although the example using the above-mentioned FG signal generator 17 as a rotational-speed detection means to detect the rotational speed of a spindle motor 16, i.e., the rotational speed of an optical disk 15, is given in the explanation mentioned above In for example, a location different from the record section where said truck on an optical disk etc. is arranged What detects the rotational speed of the optical disk 15 concerned is possible by forming the pattern of fixed spacing in concentric circular, detecting the pattern concerned on the revolving optical disk 15 in a photodetector etc., and measuring the frequency of this detected pattern signal etc.
[0116] Moreover, even if it is a magnetic disk like a hard disk or a floppy disk, this invention is applicable, although the optical disk was mentioned as the example as a disk-like record medium in this example similarly, for example.
[0117]
[Effect of the Invention] By the above explanation, it sets to the disk-like record-medium driving gear and approach of this invention so that clearly. By carrying out revolution actuation of the disk-like record medium, and detecting the reading location on a disk-like record medium based on the specific signal which shows the rotational speed of a disk-like record medium, and the break of the predetermined unit read in the disk-like record medium When revolution actuation of the disk-like record medium is carried out in a constant linear velocity or a constant angular velocity It becomes possible to be able to detect the reading location of a disk-like record medium to accuracy, therefore to double the rotational speed of a disk-like record medium with a predetermined rate promptly for example, after seeking, and access engine performance's improves.
[0118] Moreover, it sets to the disk-like record-medium driving gear and approach of this invention. When the specific signal which shows the break of a predetermined unit reads and it becomes impossible, by switching the revolution actuation state control of a disk-like record medium to the control based on rotational speed from the control based on a specific signal For example, playback of a signal is possible, though it can prevent that a revolution of a disk-like record medium overruns recklessly and the linear velocity at the time of signal record comes to differ from the linear velocity at the time of signal regeneration, even if it becomes impossible to carry out revolution actuation of the disk-like record medium in a constant linear velocity.

[Translation done.]

* NOTICES *

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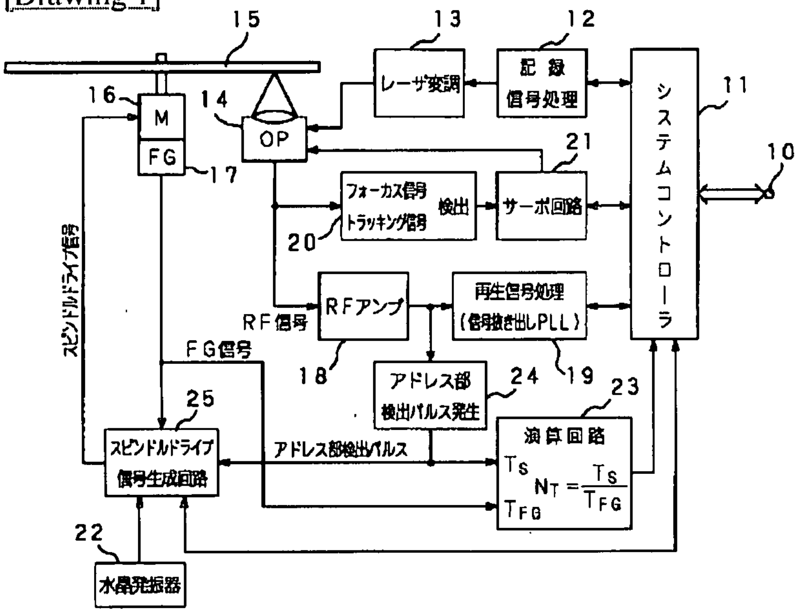
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

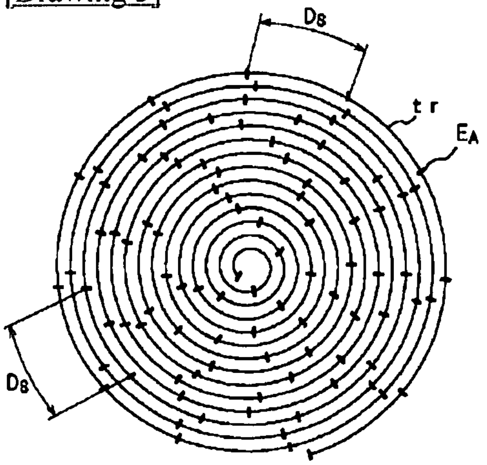
[Drawing 2]

アドレス部	フラグ部	データ部	バッファ部

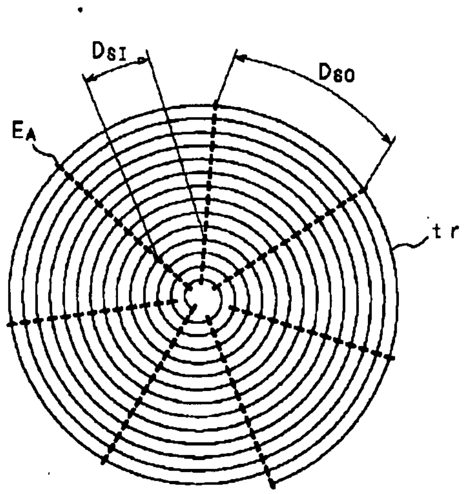
[Drawing 1]


15
13
12
16
14
M
OP
レーザ変調
記録
信号処理
システムコントローラ
11
FG
17
21
10
フォーカス信号
トラッキング信号
検出
サーボ回路
20
スピンドルドライブ信号
RFアンプ
再生信号処理
（信号抜き出しPLL）
RF信号
FG信号
18
24
19
23
アドレス部
検出パルス発生
25
演算回路
スピンドルドライブ
信号生成回路
アドレス部検出パルス
T_S
$N_T = \frac{T_S}{T_{FG}}$
T_{FG}
22
水晶発振器

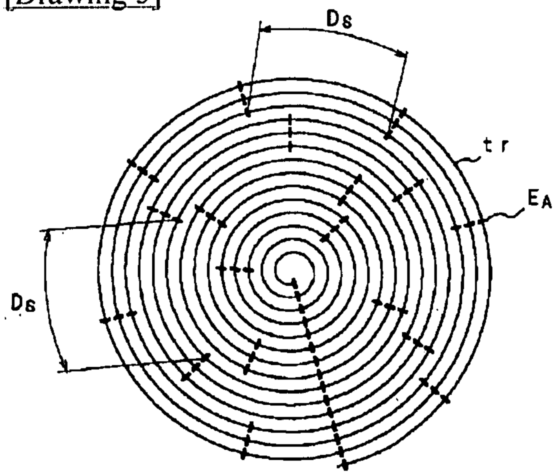
[Drawing 3]



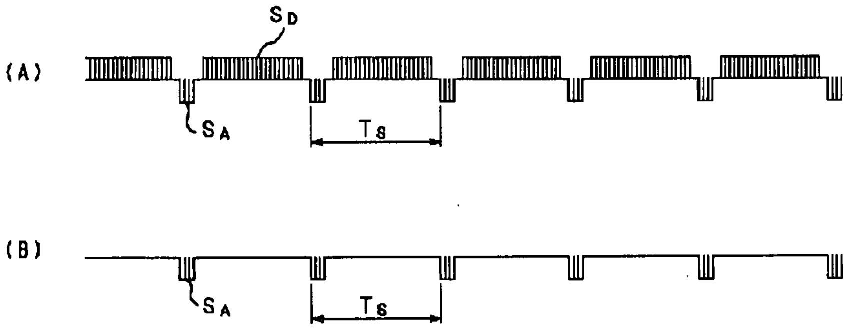
[Drawing 4]


DSI
DSO
EA
tr

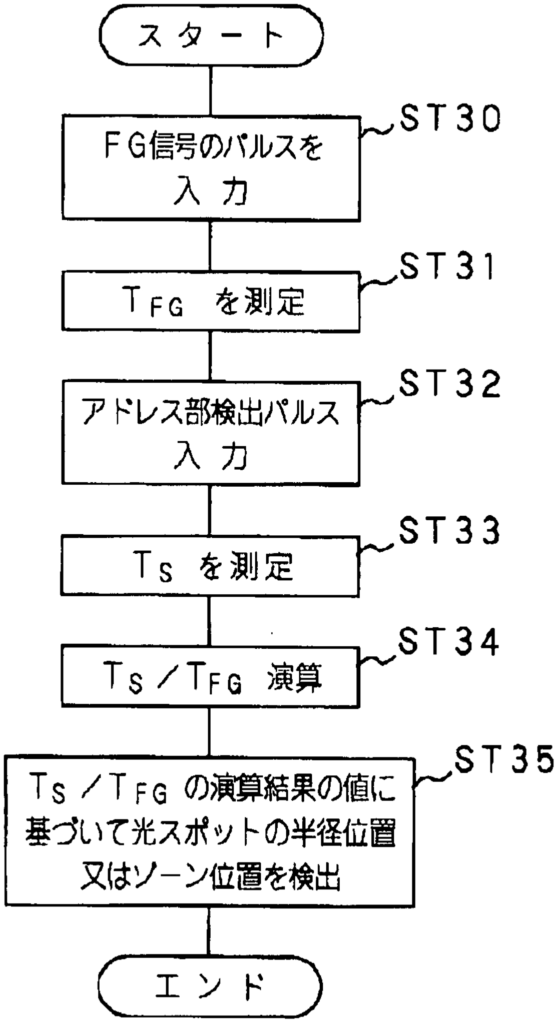
[Drawing 5]



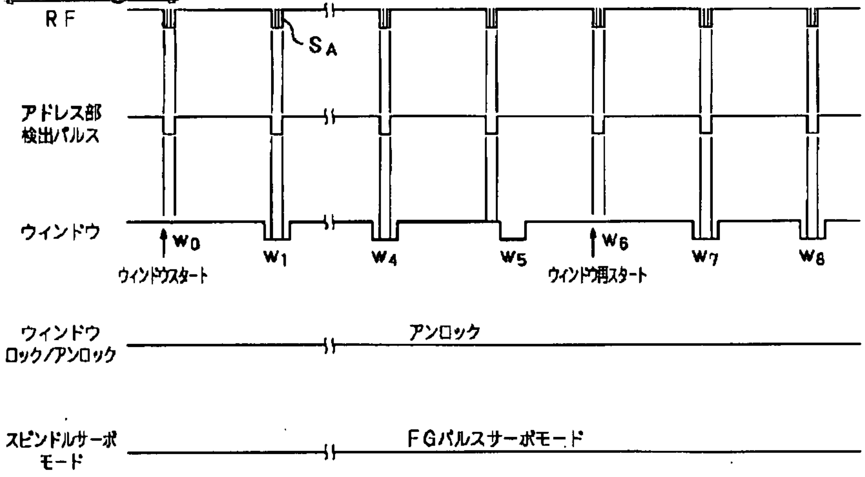
[Drawing 6]


SD
(A)
SA
TS
(B)
SA
TS

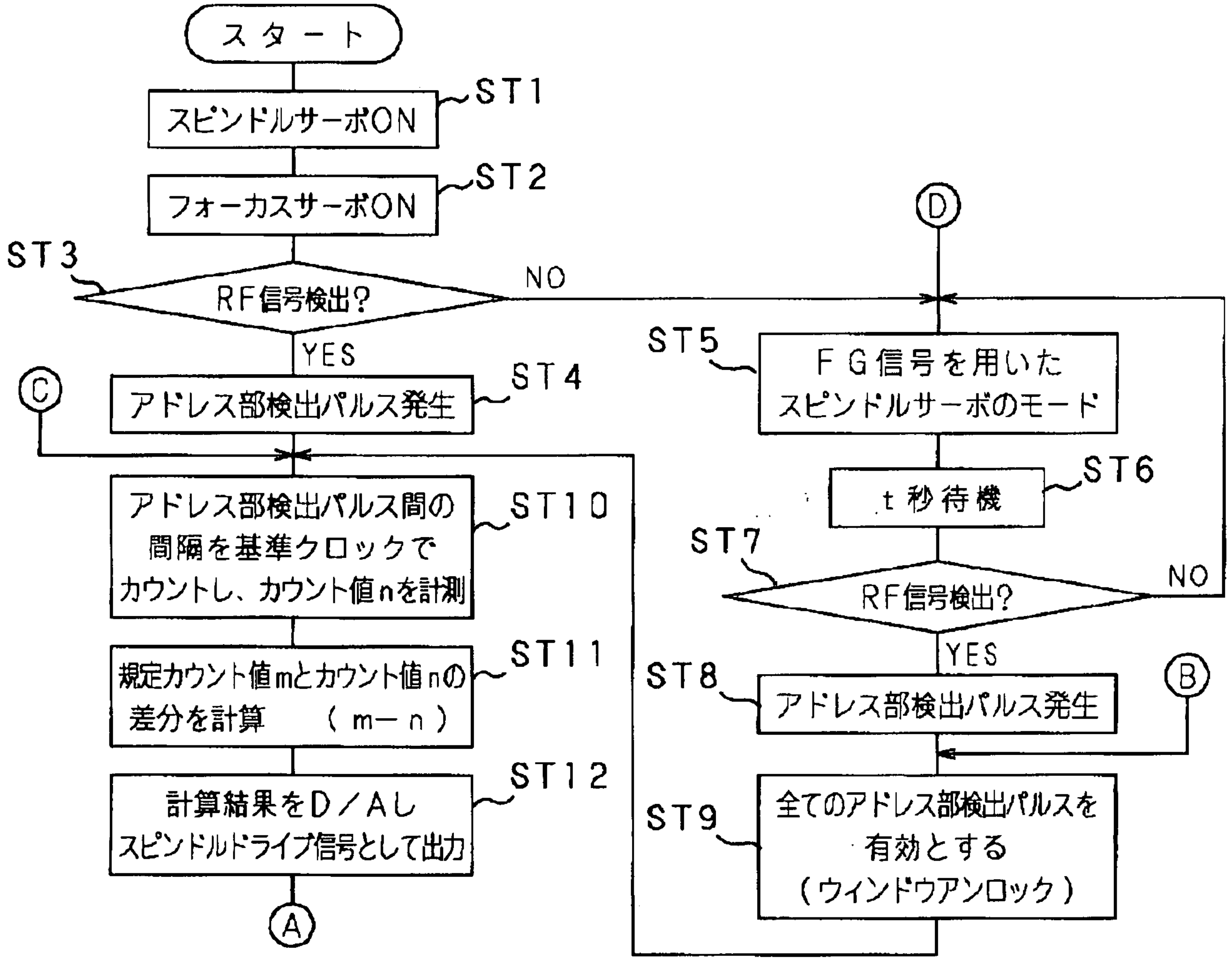
[Drawing 7]


スタート
FG信号のパルスを入力
ST30
TFG を測定
ST31
アドレス部検出パルス入力
ST32
TS を測定
ST33
TS／TFG 演算
ST34
TS／TFG の演算結果の値に基づいて光スポットの半径位置又はゾーン位置を検出
ST35
エンド

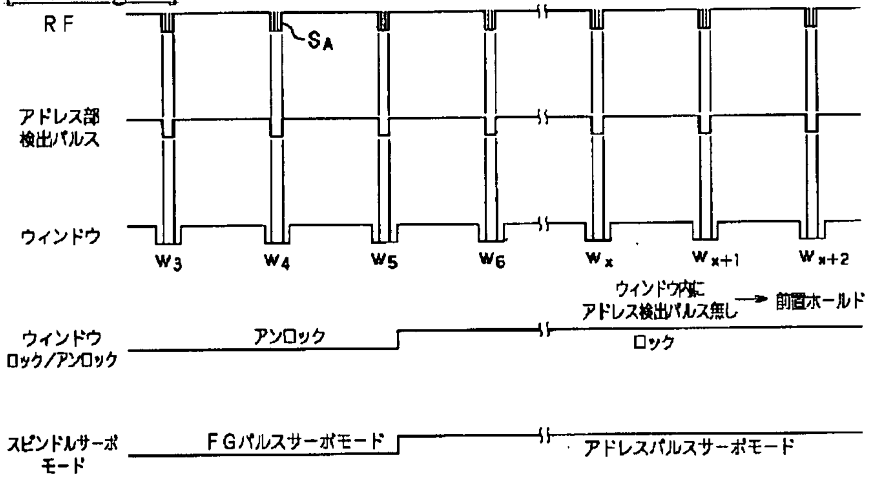
[Drawing 10]


RF
SA
アドレス部検出パルス
ウィンドウ
W0
ウィンドウスタート
W1
W4
W5
W6
ウィンドウ再スタート
W7
W8
ウィンドウロック/アンロック
アンロック
スピンドルサーボモード
FGパルスサーボモード

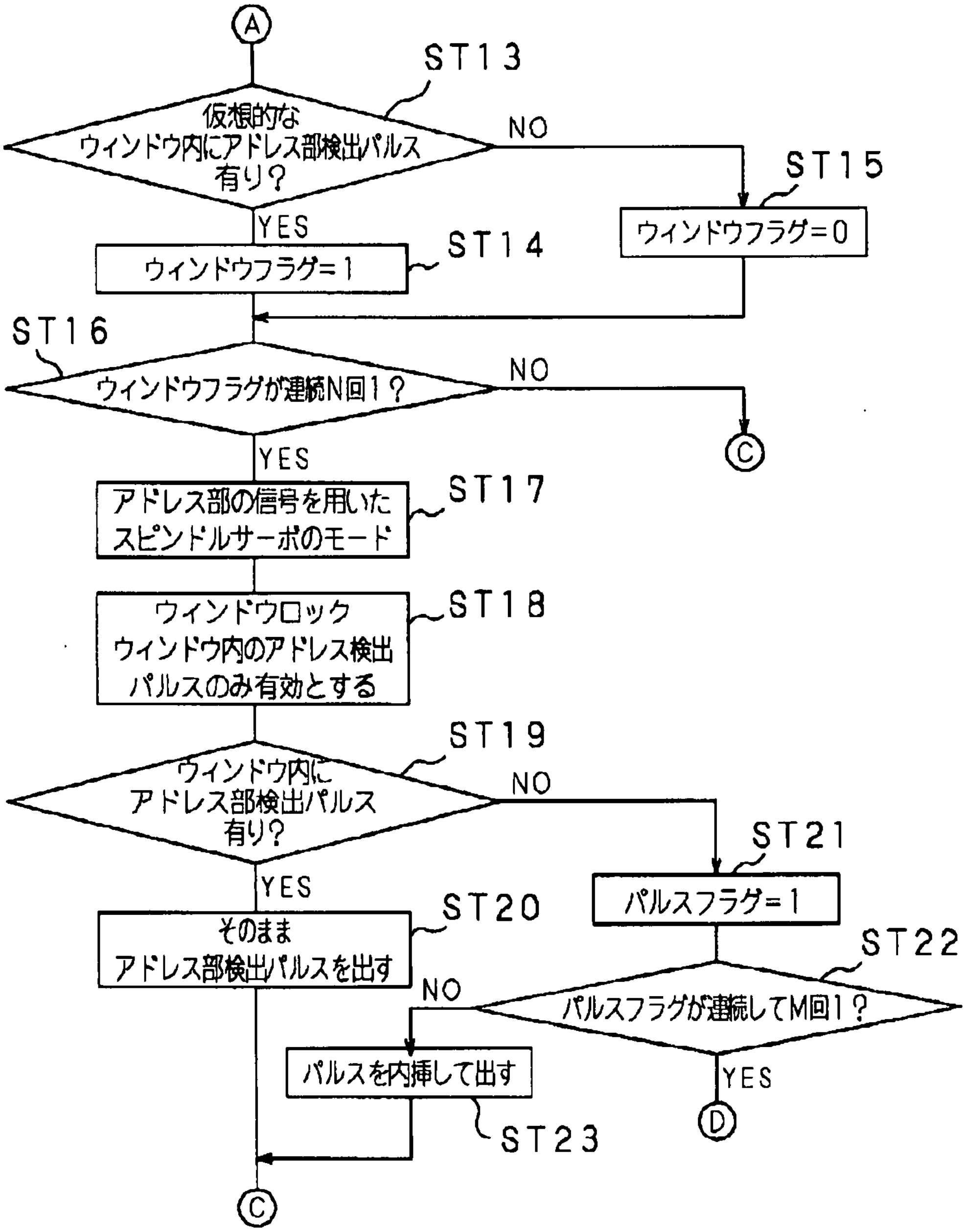
[Drawing 8]


スタート
ST1
スピンドルサーボON
ST2
フォーカスサーボON
ST3
RF信号検出?
NO
YES
ST4
アドレス部検出パルス発生
C
ST10
アドレス部検出パルス間の間隔を基準クロックでカウントし、カウント値nを計測
ST11
規定カウント値mとカウント値nの差分を計算　（m－n）
ST12
計算結果をD／Aしスピンドルドライブ信号として出力
A
D
ST5
FG信号を用いたスピンドルサーボのモード
ST6
t秒待機
ST7
RF信号検出?
NO
YES
ST8
アドレス部検出パルス発生
B
ST9
全てのアドレス部検出パルスを有効とする（ウィンドウアンロック）

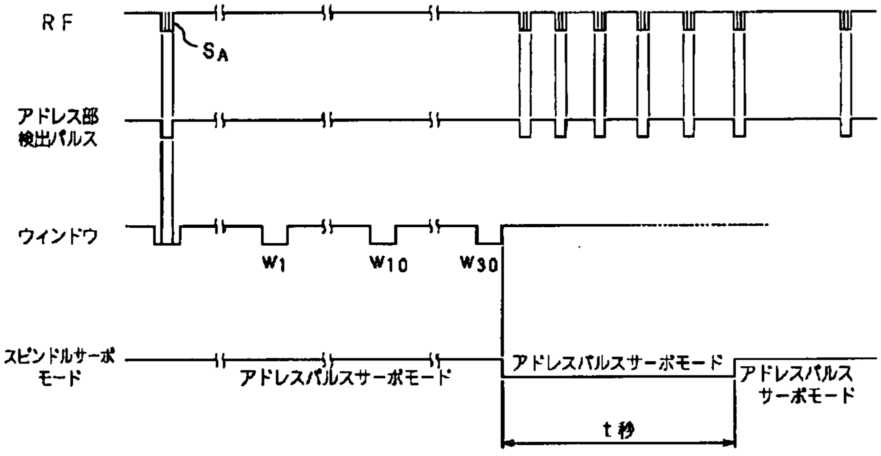
[Drawing 11]


RF
S_A
アドレス部検出パルス
ウィンドウ
W_3
W_4
W_5
W_6
W_x
W_{x+1}
W_{x+2}
ウィンドウ内にアドレス検出パルス無し → 前置ホールド
ウィンドウロック/アンロック
アンロック
ロック
スピンドルサーボモード
FGパルスサーボモード
アドレスパルスサーボモード

[Drawing 9]


A
ST13
仮想的な
ウィンドウ内にアドレス部検出パルス
有り？
NO
ST15
ウィンドウフラグ=0
YES
ウィンドウフラグ=1
ST14
ST16
ウィンドウフラグが連続N回1？
NO
C
YES
アドレス部の信号を用いた
スピンドルサーボのモード
ST17
ウィンドウロック
ウィンドウ内のアドレス検出
パルスのみ有効とする
ST18
ST19
ウィンドウ内に
アドレス部検出パルス
有り？
NO
ST21
パルスフラグ=1
YES
ST20
そのまま
アドレス部検出パルスを出す
ST22
NO
パルスフラグが連続してM回1？
パルスを内挿して出す
YES
D
ST23
C

[Drawing 12]


RF
S_A
アドレス部検出パルス
ウインドウ
W_1
W_{10}
W_{30}
スピンドルサーボモード
アドレスパルスサーボモード
アドレスパルスサーボモード
アドレスパルスサーボモード
t秒

[Translation done.]